



THE EFFECT OF FE ON THE VISCOSITY OF SILICATE MELTS BY *PD*-TITRATION AND XANES SPECTROSCOPY.

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The oxidation state of iron can exert considerable influence on magma phase equilibria and rheology. It is typically recognized that ferrous iron behaves as a network modifier in most silicate melts. Ferric iron, on the other hand, occurs both as a network former (coordination IV) and as a modifier. Despite of a wide range of spectroscopic investigations, the efficiency of iron and its oxidation state on modifying the viscosity of silicate melts is still unclear and under debate, mainly due to a lack of data on the melt structure. Here we present new viscosity data for a wide range of natural rhyolitic, trachytic, moldavitic, andesitic, latitic, pantelleritic, basaltic and basanitic compositions as well as wet chemistry and synchrotron analysis. Dry Newtonian shear viscosities were investigated at high temperature (1050-1600°C) and low temperature (616-860°C) using the concentric cylinder apparatus and the micropenetration technique, respectively. The glasses obtained by fast quenching (from different temperature) the high-T melts were measured for determining, via potassium dichromate (*PD*) titration, the $\text{Fe}^{2+}/\text{Fe}^{3+}$ ratio. The structural role of iron species was also investigated by Fe K-edge XANES spectroscopy performed at ESRF (Grenoble). Wet chemistry analyses were found consistent with high-T prediction of [1] and [2] empirical models. Fe K-edge XANES spectra allowed to interpret the rheological measurements in terms of structural played by iron species.

[1] Kress and Carmichael 1991, Contrib. Min. Petrol. 108, 82; [2] Ottonello et al.

2001, Chem. Geol. 174, 157